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## A MNEMONIC FOR CERTAIN TRIGONOMETRIC IDENTITIES.

BY L. H. RICE.

While looking over identities recently, I was struck with the advantage of using a certain set of equations, and therefore with the need for some simple way of memorizing them. These equations are:

$$\begin{aligned}\sin x &= \cos x \tan x = \cos x / \cot x = \tan x / \sec x, \\ \cos x &= \cot x \sin x = \cot x / \csc x = \sin x / \tan x, \\ \tan x &= \sin x \sec x = \sin x / \cos x = \sec x / \csc x, \\ \cot x &= \csc x \cos x = \csc x / \sec x = \cos x / \sin x, \\ \sec x &= \tan x \csc x = \tan x / \sin x = \csc x / \cot x, \\ \csc x &= \sec x \cot x = \sec x / \tan x = \cot x / \cos x.\end{aligned}$$

Some arrangement of the names of the functions, it seemed, might be devised which would afford a mnemonic; and the functions did, in the end, prove tractable, giving the following diagram.

$$\begin{array}{ccc}\tan x & & \\ \sin x & & \sec x \\ & & \\ \cos x & & \csc x \\ & & \cot x\end{array}$$

Take any function in this circle of functions and read the two adjacent functions as a product equal to that function. Or, read one of these adjacent functions *over* the next one beyond it as a quotient equal to the selected function. Or, read the other of the adjacent functions *over* the next one beyond that as another quotient equal to the selected function.

In proving identities, the reverse process comes often into play. The product of two functions being seen to consist of two functions that are separated by one function in the circle, that one is substituted for the product. Or, a quotient being seen to consist of two functions that are successive functions in the

circle, the equivalent single function on the proper side of them is substituted.

Beginners in trigonometry have no trouble in learning the circle and its use, and mentally apply it when effecting transformations, and the work thus done has a heightened interest for them and for the class.

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#### THE REQUISITE.

In education, various books and implements are not the great requisites, but a high order of teachers. In truth, a few books do better than many. The object of education is not so much to give a certain amount of knowledge, as to awaken the faculties, and give the pupil the use of his own mind; and one book, taught by a man who knows how to accomplish these ends, is worth more than libraries as usually read. It is not necessary that much should be taught in youth, but that a little should be taught philosophically, profoundly, livingly.—*William Ellery Channing.*